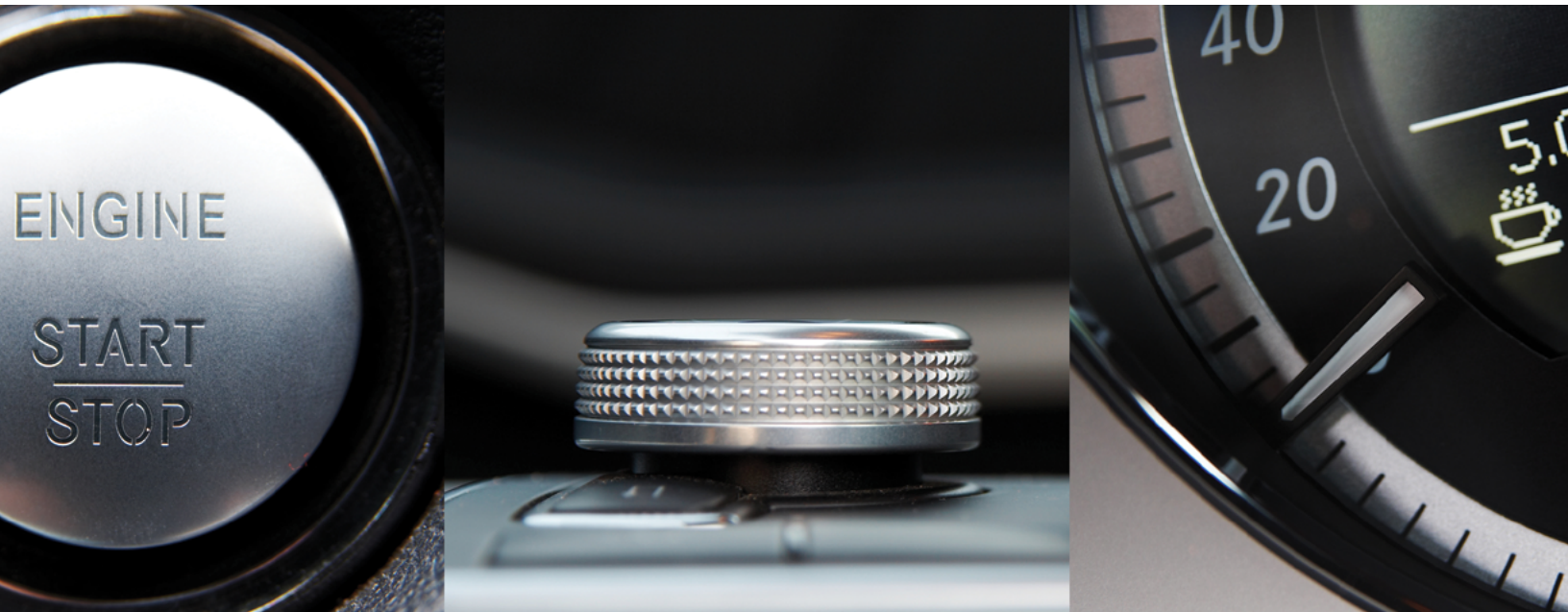# Atmel Automotive Solutions

![Atmel]

# The Atmel Automotive Commitment

As a global manufacturer of innovative integrated circuits, Atmel has about 30 years of automotive electronics design expertise and is a market leader in numerous automotive areas. Atmel develops a broad array of automotive-dedicated technologies, such as BCDMOS, Bipolar/CMOS/DMOS-on-Silicon On Insulator (BCD-on-SOI) and non-volatile CMOS. Automotive-qualified fabs (ISO 9001:2000, ISO TS 16949:2002, and ISO 14001:2004) enable Atmel to provide high-end products that not only meet strict automotive quality demands but also make vehicles safer, more economical and more convenient. Design-ins are supported by our application engineers, demonstration and evaluation kits, reference boards, software, and detailed documentation.

## Atmel Automotive Products

### Multiplexing and Standard Microcontrollers

- Atmel® AVR® 32-bit microcontrollers
- 8-bit AVR microcontrollers
- Networking (LIN, CAN)
- Atmel maXTouch® touchscreen controllers and dedicated touch controllers for buttons, sliders and wheels
- Touch library supporting Atmel's 8-bit and 32-bit microcontrollers

### Body Electronics and Powertrain

- In-vehicle networking (IVN, including LIN, CAN and microcontrollers)
- Motor control (drivers, high temperature solutions, motor-driver system basis chips, microcontrollers)
- Watchdog ICs
- Li-ion battery management and replacement of standard lead-acid batteries

### Automotive RF Solutions

- Car access

### Car Radio Solutions

### Serial EEPROMs

- 2-wire/$I^2C$ bus
- 3-wire/microwire bus
- SPI bus

# Innovative Atmel AVR Microcontroller Solutions for Automotive Applications

Increasing consumer demands for comfort, safety, and reduced fuel consumption are driving rapid growth in the market for automotive electronics. All the new functions designed to meet these demands require local intelligence and control, which can be optimized by the use of small, powerful microcontrollers.

Atmel leverages its unsurpassed experience in embedded flash memory microcontrollers to bring innovative solutions for automotive applications. These include a wide range of AVR microcontrollers for everything from sensor or actuator control to more sophisticated networking applications. Atmel microcontrollers are fully engineered to fulfill the quality requirements of OEMs in their drive towards zero defects.

## +150°C Qualified

Atmel AVR® microcontrollers are qualified for operation up to +150°C ambient temperature (AEC-Q100 Grade 0). These devices enable designers to distribute intelligence and control functions directly into or near gearboxes, transfer cases, engine sensors actuators, turbochargers and exhaust systems.

Automotive AVR solutions available in Grade 0 are the Atmel ATtiny45, ATtiny87/167, ATtiny261/ 461/861, ATmega88/168, ATmega16M1, ATmega32M1, ATmega32C1, ATmega64M1, and ATmega64C1.

Automotive AVR microcontrollers are available in two different temperature ranges to serve various applications:

- AEC-Q100 Grade 1 Z: –40°C to +125°C
- AEC-Q100 Grade 0 D, T2: –40°C to +150°C

## Atmel AVR Architecture Benefits: 8-/32-bit RISC Core: High Performance, Low-power Consumption

The AVR 8- and 32-bit architectures have reached a high level of acceptance in many market segments because they provide:

- Highest system integration with a large number of analog and digital peripherals
- Highest CPU performance with executing instructions in a single clock cycle
- Highest code density with high-level C-language optimization
- Dedicated Digital Signal Processor (DSP) and Floating Point Instructions (32-bit)
- Self-programming memory
- Product compatibility for both code and features
- Complete and low-cost tool set
- Brown-out detection and flash corruption security

## Automotive: A Completely Distributed Architecture

Carmakers are continuously adding comfort and safety features to modern vehicles, resulting in the need for more embedded computing power. As cost-effective microcontrollers become available, carmakers now have the ability to design distributed architectures with scattered and reprogrammable 8-bit microcontrollers. Alternatively, they can merge all functions into one powerful 32-bit microcontroller with multiple peripherals and networking connections.

AVR 8-bit microcontrollers are perfectly suited for distributed architectures. They feature on-chip analog interfaces for signal conditioning or programmable I/Os for actuator signaling, and Controller Area Network (CAN), Local Interconnect Network (LIN) or Pulse Wave Modulation (PWM) networking connections to the Electronic Control Unit (ECU).

Centralized architectures benefit from AVR 32-bit microcontrollers with their rich peripheral sets and multiple CAN and LIN connections.

# Atmel Capacitive Touch Solutions

## For HMI and Car Infotainment Applications

Capacitive touch solutions are entering the automotive market in integrated centerstacks, touch panels, navigation systems and radio HMI solutions. Atmel offers hardware and software library solutions for touch buttons, sliders and wheels as well as a sophisticated touchscreen controller portfolio addressing screens and pads of all common sizes up to 12 inches and more.

All touch controllers are based on Atmel's market-leading and patented charge transfer technology. They provide dedicated functionalities that meet the specific automotive requirements, such as high-temperature behavior, reliable operation in harsh environments and gloved operation.

The maXTouch® family comprises 6 touchscreen controllers with 143 to 768 nodes addressing different screen sizes, aspect ratios and sensor pitches. They deliver the X/Y coordinates of up to 16 touches via the I²C interface.

## mXT143E/ mXT224E Key Features

- Automotive grade 3: –40 to +85°C
- 143 and 224 channels
- Support up to 8″ screens
- Additional up to 32 channels touch keys
- High SNR enabling gloved-hand operation
- Support for 10 simultaneous touches
- Detect and eliminate unintended touches
- Response time <10ms from idle
- I$^2$C interface
- TQFP48 package

## mXT224S/ mXT336S Key Features

- Automotive grade 3: –40 to +85°C
- 224 and 336 channels
- Support up to 8″ screens
- Enable single layer, shieldless sensors
- High-voltage option to double the SNR ratio
- Support gloved-hand operation
- Rejection of unintended touches
- TQFP64 package

## mXT540E/ mXT768E Key Features

- Automotive grade 2: –40 to +105°C
- 540 and 768 channels
- Support up to 12″ screens
- Enable single layer, shieldless sensors
- Additional up to 64 channels touch keys
- High SNR enabling gloved-hand operation
- Support for 16 simultaneous touches
- Detects and eliminates unintended touches
- Response time <10ms from idle
- I$^2$C interface
- TQFP48 package

| Part Number | Description | Package |
|---|---|---|
| QT1110 | 11-channel Touch Controller for Touch Buttons | TQFP32 (7 x 7mm) |
| mXT143E-A | 143-channel Touchscreen Controller, Automotive Grade 3, I$^2$C Interface | TQFP48 (7 x 7mm) |
| mXT224E-A | 224-channel Touchscreen Controller, Automotive Grade 3, I$^2$C Interface | TQFP48 (7 x 7mm) |
| mXT224S-A | 224-channel Touch Controller, High Voltage, Automotive Grade 3, I$^2$C Interface | TQFP64 (10 x 10mm) |
| mXT336S-A | 336-channel Touch Controller, High Voltage, Automotive Grade 3, I$^2$C Interface | TQFP64 (10 x 10mm) |
| mXT540E-A | 540-channel Touchscreen Controller, Automotive Grade 2, I$^2$C Interface | TQFP48 (7 x 7mm) |
| mXT768E-A | 768-channel Touchscreen Controller, Automotive Grade 2, I$^2$C Interface | TQFP48 (7 x 7mm) |

## Meeting Customer Expectations

| Features | Meeting Expectations |
|---|---|
| Capacitive touch technology supports proximity detection, touch buttons, slider, wheels and touchscreens | • On-stop shop<br>• Totally integrated HMI |
| Unlimited, unambiguous touch identification, tracking and reporting | • Multi-touch support |
| Smart processing with integrated 32-bit MCU and DSP engine | • Integrated gesture calculation<br>• Suppressing unintended touches |
| Embedded post-processing algorithms | • Adjacent key suppression<br>• Noise filtering<br>• Improved EMI/ESD behavior |
| Very fast response time <10ms | • Supports character recognition |
| High SNR (signal-to-noise ratio): 80:1 | • Fingertip, back of finger touches supported<br>• Gloved finger operation |
| Advanced noise handling and filtering in hard- and firmware | • Single layer shieldless sensor support |

## Standard Automotive Atmel AVR 8–bit Microcontrollers

| Atmel Part Number | Flash (kB) | EEPROM (Bytes) | SRAM (Bytes) | I/O Pins | Vcc (V) | 10-bit A/D Channels | Analog Comparator | Motor Ctrl. Timer | 16-bit Timer | 8-bit Timer | Ext. Interrupts |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CAN** | | | | | | | | | | | |
| AT90CAN32 | 32 | 1024 | 2048 | 53 | 2.7–5.5 | 8 | Yes | | 2 | 2 | 8 |
| AT90CAN64 | 64 | 2048 | 4096 | 53 | 2.7–5.5 | 8 | Yes | | 2 | 2 | 8 |
| AT90CAN128 | 128 | 4096 | 4096 | 53 | 2.7–5.5 | 8 | Yes | | 2 | 2 | 8 |
| **megaAVR** | | | | | | | | | | | |
| ATmega48P | 4 | 256 | 512 | 23 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 26 |
| ATmega64D3 | 64 | 2048 | 4096 | 50 | 2.7–3.6 | 16 (12-bit) | 2 | | 5 | 8 | 50 |
| ATmega88P | 8 | 512 | 1024 | 23 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 26 |
| ATmega88V | 8 | 512 | 1024 | 23 | 1.8–3.6 | 8 | Yes | | 1 | 2 | 26 |
| ATmega16M1 | 16 | 512 | 1024 | 27 | 2.7–5.5 | 11 | 4 | 1 | 1 | 1 | 27 |
| ATmega164P | 16 | 512 | 1024 | 32 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 32 |
| ATmega168P | 16 | 512 | 1024 | 23 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 26 |
| ATmega169P | 16 | 512 | 1024 | 54 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 17 |
| ATmega32C1 | 32 | 1024 | 2048 | 27 | 2.7–5.5 | 11 | 4 | | 1 | 1 | 27 |
| ATmega32M1 | 32 | 1024 | 2048 | 27 | 2.7–5.5 | 11 | 4 | 1 | 1 | 1 | 27 |
| ATmega324P | 32 | 1024 | 2048 | 32 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 32 |
| ATmega328P | 32 | 1024 | 2048 | 23 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 26 |
| ATmega644P | 64 | 2048 | 4096 | 32 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 32 |
| ATmega64C1 | 64 | 2048 | 4096 | 27 | 2.7–5.5 | 11 | 4 | | 1 | 1 | 27 |
| ATmega64M1 | 64 | 2048 | 4096 | 27 | 2.7–5.5 | 11 | 4 | 1 | 1 | 1 | 27 |
| **tinyAVR** | | | | | | | | | | | |
| ATtiny1634 | 16 | 256 | 1024 | 18 | 2.7–5.5 | 12 | Yes | | 1 | 1 | 18 |
| ATtiny24 | 2 | 128 | 128 | 12 | 2.7–5.5 | 8 | Yes | | 1 | 1 | 12 |
| ATtiny25 | 2 | 128 | 128 | 6 | 2.7–5.5 | 4 | Yes | | -- | 2 | 7 |
| ATtiny261 | 2 | 128 | 128 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 (10bit) | 16 |
| ATtiny44 | 4 | 256 | 256 | 12 | 2.7–5.5 | 8 | Yes | | 1 | 1 | 12 |
| ATtiny44V | 4 | 256 | 256 | 12 | 1.8–3.6 | 8 | Yes | | -- | 1 | 12 |
| ATtiny45 | 4 | 256 | 256 | 6 | 2.7–5.5 | 4 | Yes | | -- | 2 | 7 |
| ATtiny45V | 4 | 256 | 256 | 6 | 1.8–3.6 | 4 | Yes | | 1 | 2 | 7 |
| ATtiny461 | 4 | 256 | 256 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 (10bit) | 16 |
| ATtiny84 | 8 | 512 | 512 | 12 | 2.7–5.5 | 8 | Yes | | -- | 1 | 12 |
| ATtiny85 | 8 | 512 | 512 | 6 | 2.7–5.5 | 4 | Yes | | -- | 2 | 7 |
| ATtiny85V | 8 | 512 | 512 | 6 | 1.8–3.6 | 4 | Yes | | 1 | 2 | 7 |
| ATtiny861 | 8 | 512 | 512 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 (10bit) | 16 |
| ATtiny87 | 8 | 512 | 512 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 | 16 |
| ATtiny88 | 8 | 64 | 512 | 28 | 2.7–5.5 | 8 | Yes | | 1 | 1 | 28 |
| ATtiny167 | 16 | 512 | 512 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 | 16 |

All devices have a programmable brown-out controller, on-chip 8MHz RC oscillator and a watchdog. The maximum frequency is 16MHz.

| Hardware Multiplier | PWM Channels | RTC | Self Program Memory | CAN (Mess. Obj.) | SPI | TWI | UART (LIN HW) | Packages | Max. Temp (°C) |
|---|---|---|---|---|---|---|---|---|---|
| Yes | 8 | Yes | Yes | 1 (15) | Yes | -- | 2 | VQFN64, LQFP64 | 125 |
| Yes | 8 | Yes | Yes | 1 (15) | Yes | -- | 2 | VQFN64, LQFP64 | 125 |
| Yes | 8 | Yes | Yes | 1 (15) | Yes | -- | 2 | VQFN64, LQFP64 | 125 |
|  |  |  |  |  |  |  |  |  |  |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 1 | TQFP32, VQFN32 | 125 |
| Yes | 18 | Yes | Yes |  | 5 | 2 | 3 | TQFP64 | 105 |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 1 | TQFP32, VQFN32 | 125 |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 1 | TQFP32, VQFN32 | 85 |
| Yes | 10 | -- | Yes | 1 (6) | Yes | -- | 1 (Y) | TQFP32, VQFN32 | 125 |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 2 | VQFN44, TQFP44 | 125 |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 1 | TQFP32, VQFN32 | 125 |
| Yes | 4 | Yes | Yes |  | Yes | USI | 1 | VQFN64, TQFP64 | 85 |
| Yes | 4 | -- | Yes | 1 (6) | Yes | -- | 1 (Y) | TQFP32, VQFN32 | 125 |
| Yes | 10 | -- | Yes | 1 (6) | Yes | -- | 1 (Y) | TQFP32, VQFN32 | 125 |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 2 | VQFN44, TQFP44 | 125 |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 1 | TQFP32, VQFN32 | 125 |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 2 | VQFN32, TQFP44 | 125 |
| Yes | 4 | -- | Yes | 1 (6) | Yes | -- | 1 (Y) | TQFP32, VQFN32 | 125 |
| Yes | 10 | -- | Yes | 1 (6) | Yes | -- | 1 (Y) | TQFP32, VQFN32 | 125 |
|  |  |  |  |  |  |  |  |  |  |
| -- | 4 | -- | Yes |  | 1 + USI | 2 (N) |  | VQFN20, TSSOP20 | 125 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC14 | 125 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC8 | 125 |
| -- | 6 | -- | Yes |  | Yes | USI | -- | VQFN32, VQFN20, SOIC20, TSSOP20 | 125 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC14 | 125 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC14 | 85 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC8 | 125 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC8 | 85 |
| -- | 6 | -- | Yes |  | Yes | USI | -- | VQFN32, VQFN20, SOIC20, TSSOP20 | 125 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20 | 125 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC8 | 125 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC8 | 85 |
| -- | 6 | -- | Yes |  | Yes | USI | -- | VQFN32, VQFN20, SOIC20, TSSOP20 | 125 |
| -- | 3 | Yes | Yes |  | 1 + USI | No | 1 (Y) | VQFN32, SOIC20, TSSOP20 | 125 |
| -- | 4 | -- | Yes |  | Yes | Yes |  | TQFP32, VQFN32 | 125 |
| -- | 3 | Yes | Yes |  | 1 + USI | No | 1 (Y) | VQFN32, SOIC20, TSSOP20 | 125 |

## Automotive Atmel AVR 8-bit Microcontrollers
### Grade 0 (150°C)

| Atmel Part Number | Flash (kB) | EEPROM (Bytes) | SRAM (Bytes) | I/O Pins | Vcc (V) | 10-bit A/D Channels | Analog Comparator | Motor Ctrl. Timer | 16-bit Timer | 8-bit Timer | Ext. Interrupts |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **megaAVR** | | | | | | | | | | | |
| ATmega88P | 8 | 512 | 1024 | 23 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 26 |
| ATmega16M1 | 16 | 512 | 1024 | 27 | 2.7–5.5 | 11 | 4 | 1 | 1 | 1 | 27 |
| ATmega168P | 16 | 512 | 1024 | 23 | 2.7–5.5 | 8 | Yes | | 1 | 2 | 26 |
| ATmega32C1 | 32 | 1024 | 2048 | 27 | 2.7–5.5 | 11 | 4 | | 1 | 1 | 27 |
| ATmega32M1 | 32 | 1024 | 2048 | 27 | 2.7–5.5 | 11 | 4 | 1 | 1 | 1 | 27 |
| ATmega64C1 | 64 | 2048 | 4096 | 27 | 2.7–5.5 | 11 | 4 | | 1 | 1 | 27 |
| ATmega64M1 | 64 | 2048 | 4096 | 27 | 2.7–5.5 | 11 | 4 | 1 | 1 | 1 | 27 |
| **tinyAVR** | | | | | | | | | | | |
| ATtiny261 | 2 | 128 | 128 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 (10bit) | 16 |
| ATtiny45 | 4 | 256 | 256 | 6 | 2.7–5.5 | 4 | Yes | | -- | 2 | 7 |
| ATtiny461 | 4 | 256 | 256 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 (10bit) | 16 |
| ATtiny87 | 8 | 512 | 512 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 | 16 |
| ATtiny861 | 8 | 512 | 512 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 (10bit) | 16 |
| ATtiny167 | 16 | 512 | 512 | 16 | 2.7–5.5 | 11 | Yes | | 1 | 1 | 16 |

All devices have a programmable brown-out controller, on-chip 8MHz RC oscillator and a watchdog. The maximum frequency is 16MHz.

## Automotive Atmel AVR 32-bit Microcontrollers

| Atmel Part Number | Core (DMIPS) | Flash (kB) | SRAM (kB) | DMA | I/O Pins | $V_{cc}$ (V) | ADC Channels | DAC Channels |
|---|---|---|---|---|---|---|---|---|
| UC3C0128 | AVR32 (68) | 128 | 32 | 16c & event system | 123 | 3.0-3.6 / 4.5-5.5 | 12b 16c | 12b 4c |
| UC3C1128 | AVR32 (68) | 128 | 32 | 16c & event system | 81 | 3.0-3.6 / 4.5-5.5 | 12b 16c | 12b 4c |
| UC3C2128 | AVR32 (68) | 128 | 32 | 16c & event system | 45 | 3.0-3.6 / 4.5-5.5 | 12b 11c | 12b 4c |
| UC3C0256 | AVR32 (68) | 256 | 64 | 16c & event system | 123 | 3.0-3.6 / 4.5-5.5 | 12b 16c | 12b 4c |
| UC3C1256 | AVR32 (68) | 256 | 64 | 16c & event system | 81 | 3.0-3.6 / 4.5-5.5 | 12b 16c | 12b 4c |
| UC3C2256 | AVR32 (68) | 256 | 64 | 16c & event system | 45 | 3.0-3.6 / 4.5-5.5 | 12b 11c | 12b 4c |
| UC3C0512 | AVR32 (68) | 512 | 64 | 16c & event system | 123 | 3.0-3.6 / 4.5-5.5 | 12b 16c | 12b 4c |
| UC3C1512 | AVR32 (68) | 512 | 64 | 16c & event system | 81 | 3.0-3.6 / 4.5-5.5 | 12b 16c | 12b 4c |
| UC3C2512 | AVR32 (68) | 512 | 64 | 16c & event system | 45 | 3.0-3.6 / 4.5-5.5 | 12b 11c | 12b 4c |
| UC3A0512 | AVR32 with MPU (91) | 512 | 64 | 15c | 109 | 3.0-3.6 (5V tolerant) | 10b 8c | Audio DAC |

All devices have a programmable brown-out controller, on-chip 8MHz RC oscillator and a watchdog.
The maximum frequency is 66MHz (UC3A0512) and 50MHz (all others).

| Hardware Multiplier | PWM Channels | RTC | Self Program Memory | CAN (Mess. Obj.) | SPI | TWI | UART (LIN HW) | Packages | Max. Temp (°C) |
|---|---|---|---|---|---|---|---|---|---|
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 1 | TQFP32, VQFN32 | 150 |
| Yes | 10 | -- | Yes | 1 ( 6 ) | Yes | -- | 1 ( Y ) | TQFP32, VQFN32 | 150 |
| Yes | 6 | Yes | Yes |  | 1 + USART | Yes | 1 | TQFP32, VQFN32 | 150 |
| Yes | 4 | -- | Yes | 1 ( 6 ) | Yes | -- | 1 ( Y ) | TQFP32, VQFN32 | 150 |
| Yes | 10 | -- | Yes | 1 ( 6 ) | Yes | -- | 1 ( Y ) | TQFP32, VQFN32 | 150 |
| Yes | 4 | -- | Yes | 1 ( 6 ) | Yes | -- | 1 ( Y ) | TQFP32, VQFN32 | 150 |
| Yes | 10 | -- | Yes | 1 ( 6 ) | Yes | -- | 1 ( Y ) | TQFP32, VQFN32 | 150 |
|  |  |  |  |  |  |  |  |  |  |
| -- | 6 | -- | Yes |  | Yes | USI | -- | VQFN32, VQFN20, SOIC20, TSSOP20 | 150 |
| -- | 4 | -- | Yes |  | USI | USI | -- | VQFN20, SOIC8 | 150 |
| -- | 6 | -- | Yes |  | Yes | USI | -- | VQFN32, VQFN20, SOIC20, TSSOP20 | 150 |
| -- | 3 | Yes | Yes |  | 1 + USI | No | 1 ( Y ) | VQFN32, SOIC20, TSSOP20 | 150 |
| -- | 6 | -- | Yes |  | Yes | USI | -- | VQFN32, VQFN20, SOIC20, TSSOP20 | 150 |
| -- | 3 | Yes | Yes |  | 1 + USI | No | 1 ( Y ) | VQFN32, SOIC20, TSSOP20 | 150 |

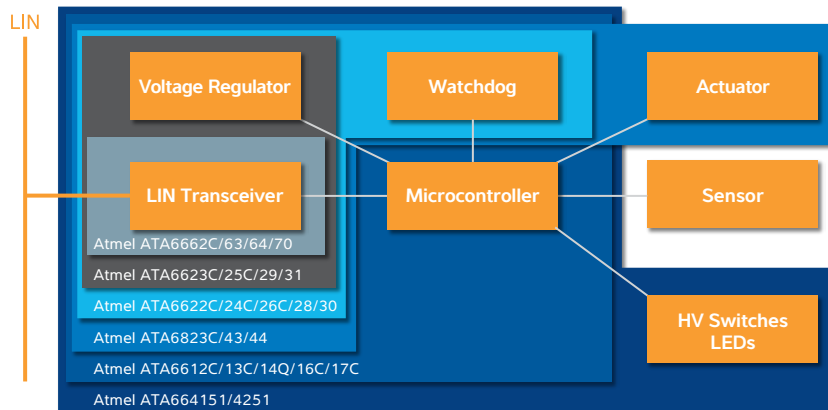| Analog Comparator | 16-bit Timer | Extended Timers | Ext. Interrupts | DSP Instructions | RTC | CAN (Mailboxes) | Ethernet | USB | USART (LIN HW) | SPI | TWI | I²S | EBI | Package | Max. Temp. (°C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 6 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 5 ( 5 ) | 2 | 3 | 1 | Y | LQFP144 | 125 |
| 4 | 6 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 5 ( 5 ) | 2 | 3 | 1 | - | TQFP100 | 125 |
| 2 | 3 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 4 ( 4 ) | 1 | 2 | 1 | - | TQFP64/QFN64 | 125 |
| 4 | 6 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 5 ( 5 ) | 2 | 3 | 1 | Y | LQFP144 | 125 |
| 4 | 6 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 5 ( 5 ) | 2 | 3 | 1 | - | TQFP100 | 125 |
| 2 | 3 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 4 ( 4 ) | 1 | 2 | 1 | - | TQFP64/QFN64 | 125 |
| 4 | 6 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 5 ( 5 ) | 2 | 3 | 1 | Y | LQFP144 | 125 |
| 4 | 6 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 5 ( 5 ) | 2 | 3 | 1 | - | TQFP100 | 125 |
| 2 | 3 | 20b 4c motor control | 8 | Y & FPU | Y | 2 ( 16 ) | 1 | FS | 4 ( 4 ) | 1 | 2 | 1 | - | TQFP64/QFN64 | 125 |
| - | 3 | 20bit 7c PWM | 8 | Y | Y | - | 1 | FS-OTG | 4 ( 0 ) | 2 | 1 | 1 | Y | LQFP144 | 85 |
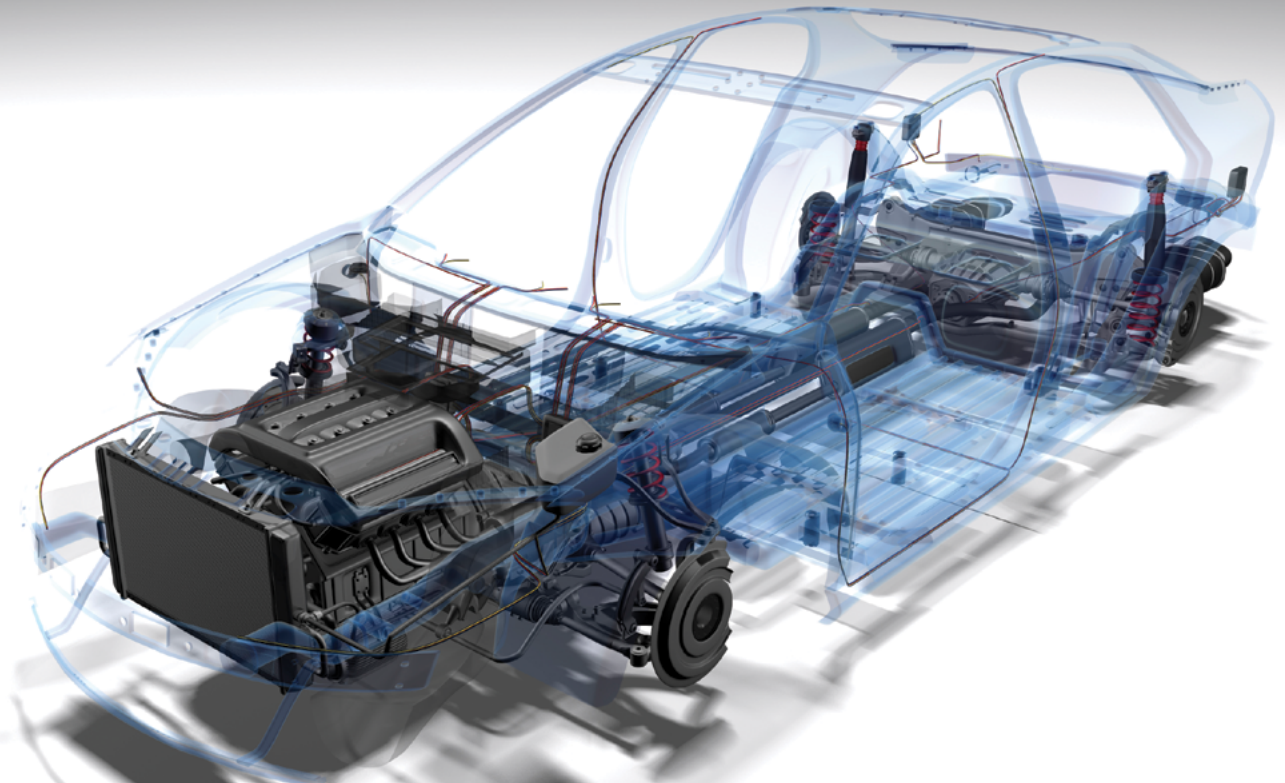
# Body Electronics and Powertrain

With 30 years experience in body electronic and power-train designs, Atmel is a market leader in numerous areas. In the ever-growing LIN bus system segment, Atmel offers products at all integration levels—from simple transceiver ICs to complex system basis chips (SBC). At higher integration levels, Atmel provides complete System-in-Package (SIP) solutions, including an Atmel AVR microcontroller, LIN transceiver, voltage regulator and watchdog in one single package.

The advantages of silicon on insulator (SOI) technology make it possible to develop ICs with outstanding electromagnetic immunity (EMI and ESD). Atmel is committed to offering its customers optimal LIN solutions as the LIN area continues to develop and evolve. Atmel driver ICs are capable of handling environmental temperatures of 150ºC and junction temperatures

of 200ºC, making their use possible in most high-temperature automotive applications.

With few external components, Atmel driver ICs with LIN communication and AVR microcontrollers combine to create cost-efficient motor driver modules complete with LIN functionality, which can equally be used in harsh automotive conditions.

• In-Vehicle Networking (IVN, including LIN, CAN, and microcontrollers)
• Standard and high-temperature drivers, motor-driver system basis chips
• Watchdogs
• Li-ion battery management and replacement of standard lead-acid batteries

LIN



Voltage Regulator | Watchdog | Actuator

LIN Transceiver | Microcontroller | Sensor

Atmel ATA6662C/63/64/70
Atmel ATA6623C/25C/29/31
Atmel ATA6622C/24C/26C/28/30
Atmel ATA6823C/43/44
Atmel ATA6612C/13C/14Q/16C/17C
Atmel ATA664151/4251

HV Switches LEDs

## In-Vehicle Networking ICs

The modular Atmel LIN family includes simple transceiver ICs (Atmel ATA6662C/63/64/70), complex system basis chips (Atmel ATA6622C/23C/24C/25C/26C/28/29/30/31) and system-in-package modules (Atmel ATA6612C/13C/14Q/16C/17C) with complete system integration and advanced LIN ASSPs (ATA664151/4251) as well as system basis chips for motor-driver applications (ATA6823C/43/44).

## LIN Family ICs

| Part No. | Description | Package |
|---|---|---|
| ATA6612C | Atmel AVR LIN SiP, ATmega88 Microcontroller with LIN Transceiver, 5V Voltage Regulator, and Window Watchdog in Single Package | QFN48 |
| ATA6613C | Atmel AVR LIN SiP, ATmega168 Microcontroller with LIN Transceiver, 5V Voltage Regulator, and Window Watchdog in Single Package | QFN48 |
| ATA6614Q | AVR LIN SiP, ATmega328P Microcontroller with LIN Transceiver, 5V Voltage Regulator, and Window Watchdog in Single Package | QFN48 |
| ATA6616C | Atmel AVR LIN SiP, ATtiny87 Microcontroller with LIN Transceiver, 5V Voltage Regulator, Window Watchdog and Hardware LIN UART in Tiny Single Package | QFN32 |
| ATA6617C | Atmel AVR LIN SiP, ATtiny167 Microcontroller with LIN Transceiver, 5V Voltage Regulator, Window Watchdog and Hardware LIN UART in Tiny Single Package | QFN32 |
| ATA6622C | LIN System Basis Chip with LIN Transceiver, Integrated 3.3V/50mA Voltage Regulator and Window Watchdog | QFN20 |
| ATA6623C | LIN System Basis Chip with LIN Transceiver and Integrated 3.3V/50mA Voltage Regulator | SO8 |
| ATA6624C | LIN System Basis Chip with LIN Transceiver, Integrated 5V/50mA Voltage Regulator and Window Watchdog | QFN20 |
| ATA6625C | LIN System Basis Chip with LIN Transceiver and Integrated 5V/50mA Voltage Regulator | SO8 |
| ATA6626C | LIN System Basis Chip Including LIN Transceiver without TxD Time-out Timer, Integrated 5V/50mA Voltage Regulator and Window Watchdog | QFN20 |
| ATA6628 | LIN System Basis Chip with LIN Transceiver, Integrated 3.3V/50mA Voltage Regulator and Window Watchdog | QFN20 |
| ATA6629 | LIN System Basis Chip with LIN Transceiver and Integrated 3.3V/50mA Voltage Regulator | SO8 |
| ATA6630 | LIN System Basis Chip with LIN Transceiver, Integrated 3.3V/50mA Voltage Regulator and Window Watchdog | QFN20 |
| ATA6631 | LIN System Basis Chip with LIN Transceiver and Integrated 3.3V/50mA Voltage Regulator | SO8 |
| ATA664151 | LIN System Basis Chip with LIN Transceiver, 5V Regulator, Watchdog, 8-channel High Voltage Switch/LED Interface with High-voltage Current Sources, 16-bit SPI | QFN32 |
| ATA664251 | 16K Flash Microcontroller with LIN Transceiver, 5V Regulator, Watchdog, 8-channel High Voltage Switch / LED Interface with High-voltage Current Sources, 16-bit SPI | QFN48 |
| ATA6662C | LIN Transceiver, Physical Layer According to Specification 2.1 | SO8 |
| ATA6663 | LIN Transceiver, Physical Layer According to Specification 2.1 | SO8, DFN8 |
| ATA6664 | LIN Transceiver, Physical Layer According to Specification 2.1, without Time-out Feature | SO8 |
| ATA6670 | Fully Integrated Dual-LIN Transceiver Complying to LIN Specification 2.0, 2.1 and SAEJ2602, with Advanced EMI/ESD Performance and TXD-dominant Time-out Feature | DFN14 |
| ATA6823C | LIN System Basis Chip with H-bridge DC Motor Driver. Integrated 3.3V/5V/100mA Power Supply, LIN Transceiver, Watchdog | QFN32 |
| ATA6843 | 30V BLDC Motor System Basis Chip, LIN Interface, Window Watchdog and Voltage Regulator, Coast Function | QFN48 |
| ATA6844 | 30V BLDC Motor System Basis Chip, LIN Interface, Window Watchdog and Voltage Regulator, $T_{junction}$ up to 200°C, Coast Function | QFN48 |

# High-Temperature Drivers

Atmel driver ICs are available for high-temperature appli-
cations in mechatronic solutions such as turbocharger or
exhaust gas recirculation systems. Many flaps have to
be controlled by DC motor driver ICs, which are located
very close to the hot engine. Due to the advantages
of our proprietary Silicon-on-Insulator (SOI) technology
(Atmel SMART-I.S.®), these driver ICs can withstand
ambient temperatures up to 150°C/302°F and chip
temperatures up to 200°C/392°F.
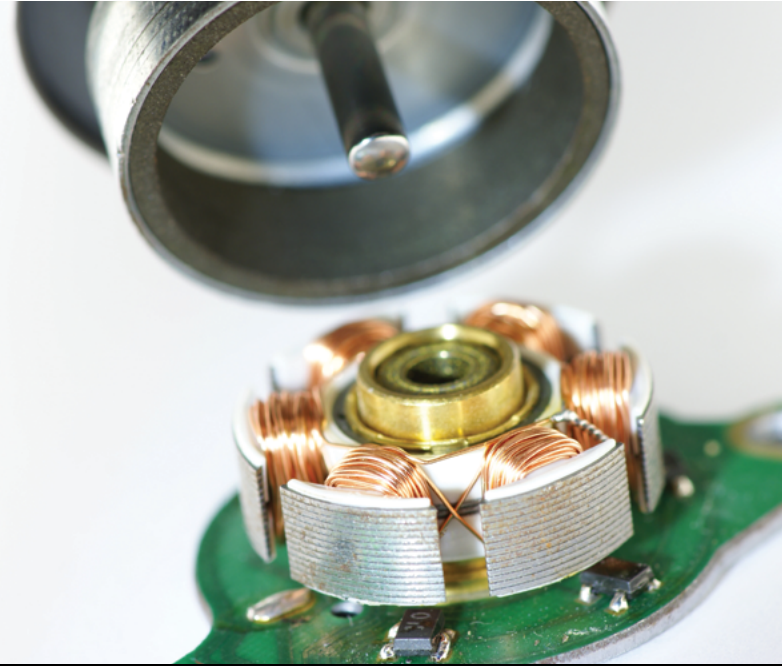
## High-Temperature Drivers

| Part No. | Description | Package |
|----------|-------------|---------|
| ATA6824C | H-bridge DC Motor Driver System Basis Chip. Integrated 3.3V/5V /100mA Power Supply, Window Watchdog and Serial Interface | QFN32, TQFP32 |
| ATA6832C | Triple Half-bridge Driver with 3 High-side and 3 Low-side Drivers, 1000mA Current Limitation and PWM > 20kHz | QFN18 |
| ATA6844 | 30V BLDC Motor System Basis Chip with 3 Half-bridge Gate Drivers, LIN Interface, Window Watchdog and Voltage Regulator, $T_{junction}$ up to 200°C, Coast Function | QFN48 |

## Standard Driver ICs

| Part No. | Description | Package |
|----------|-------------|---------|
| ATA6823C | LIN System Basis Chip with H-bridge DC Motor Driver. Integrated 3.3V/5V/100mA Power Supply, LIN Transceiver, Watchdog, 2 High-side and 2 Low-side Gate Drivers | QFN32 |
| ATA6826C | Triple Half-bridge Driver with Serial Input Control, 3 High-side and 3 Low-side Drivers, 1000mA Current Limitation | SO14 |
| ATA6831C | Triple Half-bridge Driver with Serial Input Control and 25-kHz PWM Input, 3 High-side and 3 Low-side Drivers, 1000mA Current Limitation | QFN18 |
| ATA6836C | Hex Half-bridge Driver with Serial Input Control, 6 High-side and 6 Low-side Drivers, 650mA Current Limitation | SO28, QFN24 |
| ATA6838C | Hex Half-bridge Driver with Serial Input Control, 6 High-side and 6 Low-side Drivers, 950mA Current Limitation | QFN24 |
| ATA6843 | 30V BLDC Motor System Basis Chip, LIN Interface, Window Watchdog and Voltage Regulator, Coast Function | QFN48 |

# Battery Solutions

## Li-ion Battery Management

With the ATA6870N, Atmel provides a measurement and monitoring circuit designed for high-cell-count Li-ion battery systems in industrial and automotive applications such as electrical and hybrid electrical vehicles, ebikes or uninteruptible power supplies. It monitors the battery-cell voltage and the battery-cell temperature with a 12-bit ADC. The circuit also provides active and passive charge-balancing capability for each battery cell. Up to 16 circuits (96 cells) can be cascaded in one string.

## Intelligent Battery Sensor

The Atmel megaAVR® ATmega32HVE2 and ATmega64HVE2 MCUs improve the performance and longevity of 12V standard lead-acid batteries. Designed for intelligent battery sensor applications, the devices determine the state of charge and state of health for 12V standard lead-acid batteries by measuring the battery voltage, current and temperature. For cars with idle-stop-go function, this feature is mandatory to retain sufficient battery energy for a guaranteed engine start. Combined with the Atmel ATA6870N Li-ion battery monitor IC, it forms an ideal system solution for replacing 12V standard lead-acid batteries with Li-ion batteries.

| Part No. | Description | Package |
|---|---|---|
| ATA6870N | Battery-cell Measuring, Power Supply and Charge Balancing Circuit for Multi-cell Li-ion Battery Stacks | QFN48 |
| ATmega32HVE2/ ATmega64HVE2 | Intelligent Battery Sensor System with Two 17/18bit $\Sigma\Delta$ ADCs, Programmable Gain Amplifier, Power Supply, LIN Trx, 8bit AVR Core with 32bit Math. Extension and 32k/64k Flash Memory | QFN48 |

## Stand-alone Body Electronic ICs

### Watchdog ICs

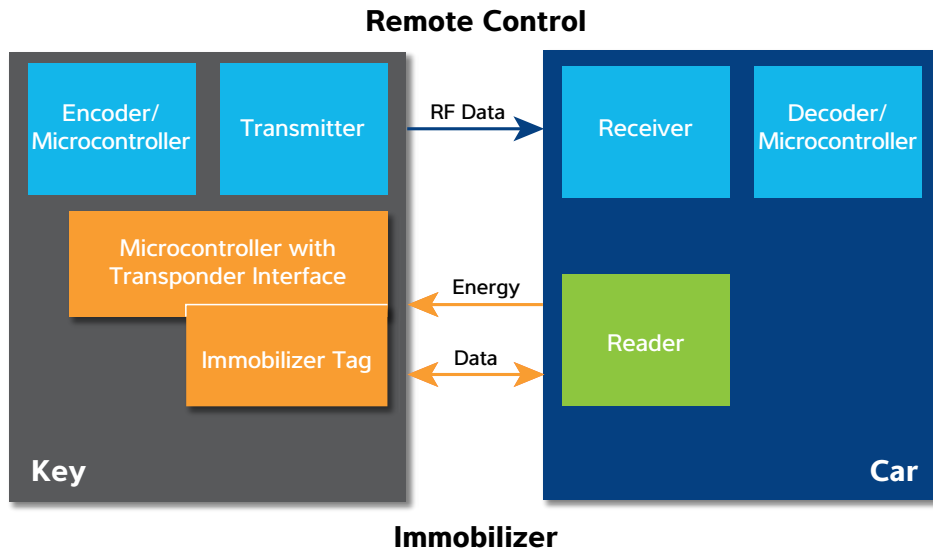| Part No. | Description | Package |
|----------|-------------|---------|
| ATA6020 | Watchdog IC, Programmable via Metal Mask (Based on the Atmel ATAR080 Microcontroller) | SO20 |
| ATA5021 | Watchdog Timer, Active and Sleep Mode, 1 Wake-up Input, Enable Output | SO8 |



# Automotive RF Solutions

## Car Access

Having launched its first dedicated car access Atmel continues to recognize the importance of security in the automotive area. Atmel offers a comprehensive range of car access solutions from immobilizers to full-duplex transceivers perfect for the prevention of automotive theft. The Atmel automotive safety portfolio also features extremely secure Passive Entry Go (PEG) solutions. In fact, Atmel provides all the devices needed to design a complete car access system. Customers have the flexibility to create their own dedicated designs using the low-power Atmel transmitter IC, receiver IC, and microcontroller families.

## Uni-directional System

RF link for the keyless entry function to open or lock the doors. The immobilizer system is built with a bi-directional
Low Frequency (LF) link operating with the AUT64 crypto algorithm.

**Remote Control**

| Key | | Car |
|---|---|---|
| Encoder/Microcontroller | Transmitter → RF Data → | Receiver · Decoder/Microcontroller |
| Microcontroller with Transponder Interface | ← Energy | Reader |
| Immobilizer Tag | ↔ Data | |

**Immobilizer**

## Bi-directional System and Wake-up Channel for Passive EntryGo Solution

RF link for the Remote Keyless Entry (RKE) function as well as for the extremely secure duplex RF link in a
Passive Entry Go system. The LF link is used for the wake-up channel in a PEG system as well as for the immobilizer
function to start the RF communication.

**Remote Control**

| Key | | Car |
|---|---|---|
| Encoder/Microcontroller | Transmitter → RF Data → / ← RF Data | Receiver · Decoder/Microcontroller |
| 3D Wake-up | ← Energy | Antenna Driver |
| Immobilizer Tag | ← Energy / ↔ Data | Receiver |

**Immobilizer**
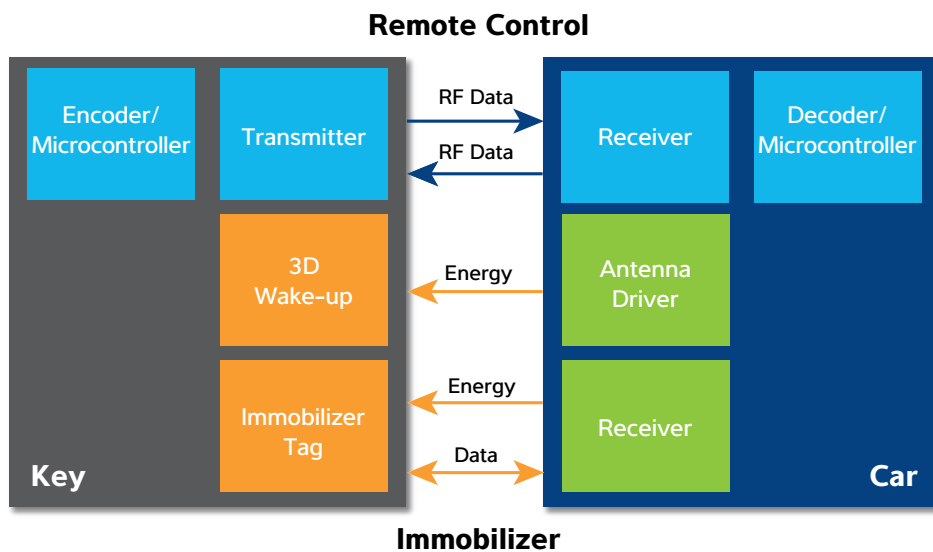
# Car Access Devices

| Part No. | Frequency Range | Modulation | Description | Package |
|---|---|---|---|---|
| ATA5279C | 105–155kHz | ASK/FSK | Six-fold LF Antenna Driver IC | QFN48 |
| ATA5580 | 125kHz | Bi-phase, Manchester, QPLM | AES-128-based Read/Write Immobilizer Transponder Incorporating Low-power AVR MCU | Plastic/Brick |
| ATA5723C | 315MHz | ASK/FSK | UHF Remote Control Receiver, 300kHz Bandwidth RSSI Pin Compatible to ATA5724C, ATA5728C | SSO20 |
| ATA5724C | 433MHz | ASK/FSK | UHF Remote Control Receiver, 300kHz Bandwidth, RSSI Pin Compatible to ATA5723C, ATA5728C | SSO20 |
| ATA5728C | 868MHz | ASK/FSK | UHF Remote Control Receiver, 600kHz Bandwidth, RSSI Pin Compatible to ATA5723C, ATA5724C | SSO20 |
| ATA5745C ATA5746C | 433MHz 315MHz | ASK/FSK | Transparent UHF Receiver IC with Fast RKE/TPMS Switching Rate, Suited to 1 to 20Kbits/s Manchester FSK with 4 Programmable Bit-rate Ranges, High FSK Sensitivity (−114dBm at 2.4Kbits/s), High Blocking Capability | QFN24 |
| ATA5749C | 315–433MHz | ASK/FSK | Low-current Fully Integrated Fractional-N PLL Transmitter with Scalable Output Power (−0.5 to 12.5dBm) | TSSOP10 |
| ATA5756C ATA5757C | 315MHz 433MHz | ASK/FSK | UHF Transmitter ICs with Low Settling Time and Active Current Consumption | TSSOP10 |
| ATA5771C ATA5773C ATA5774C | 868–928MHz 315MHz 433MHz | ASK/FSK | AVR Microcontroller-based RF Transmitter Family | QFN24 |
| ATA5781 ATA5782 ATA5783 | 310-318MHz 418-477MHz 836-956MHz | ASK/FSK | RF Receiver IC Family Featuring Lowest Power Consumption and High Sensitivity, Same Receiver IPs as ATA583x | QFN32 |
| ATA5790N | 125kHz | BPLM*/ QPLM**/ Manchester/ Biphase | AES-128-based Passive Entry Go (PEG) IC for the Key, Including an Embedded Ultra-low-power AVR 8-bit Microcontroller, an LF Hardware AES Module for Immobilization, and a 3D LF Receiver Module | QFN38 |
| ATA5791 | 315MHz, 433MHz | ASK/FSK Manchester | AES-128-based Embedded AVR Microcontroller Including RF Transmitter and Complete LF Functionality for Passive Entry/ Passive Start Keys | QFN38 |
| ATA5795C | 125kHz 315–433 MHz | BPLM*/ QPLM**/ Manchester/ Biphase ASK/FSK | AES-128-based Remote Keyless Entry (RKE) IC for the Key, Including an Embedded Ultra-low-power AVR 8-bit Microcontroller, the Dedicated RF Transmitter ATA5749C and the LF Hardware AES Module for Immobilization in a Single Package | QFN32 |
| ATA5811C ATA5812C | 433.868MHz 315MHz | ASK/FSK | UHF Transceiver IC with Extremely Low Current Consumption and Small Size | QFN48 |
| ATA5823C ATA5824C | 312.5–317.5MHz 433–868MHz | ASK/FSK | UHF Multi-channel Half-/Full-duplex Transceiver with Low Power Consumption | QFN48 |
| ATA5830N | 310–318MHz, 418–477MHz, 836–928MHz | ASK/FSK | Highly Sensitive UHF ASK/FSK Transceiver, Maximum Power-down Current 600nA | QFN32 |
| ATA5831 ATA5832 ATA5833 | 310–318MHz 418–477MHz 836-956MHz | ASK/FSK | MCU-based RF Transceiver ICs Featuring Lowest Power Consumption and High Sensitivity | QFN32 |
| T5750C T5753C T5754C | 868–928MHz 310–330MHz 429–439MHz | ASK/FSK | UHF Transmitter IC with High Output Power and Wide Temperature Range (−40°C/F to +85°C/185°F, +125°C/257°F) | TSSOP8 |

*BPLM = Binary Pulse Length Modulation   **QPLM = Quad Pulse Length Modulation

# Serial EEPROMs

Atmel automotive-grade serial EEPROM products were first introduced in 1996. Over the years, Atmel has integrated rigorous quality and reliability systems into every step of the automotive manufacturing flow, while continuing to provide highly competitive solutions and keep pace with customers' demand. This enables Atmel to maintain the premier quality and delivery standards mandated by international automotive customers. Within its extensive product portfolio, Atmel offers automotive-grade serial products in 2-wire, 3-wire, and Serial Programming Interface (SPI) bus protocols in Small-Outline Integrated Circuit (SOIC), Thin Shrink Small Outline Package (TSSOP), and Plastic Dual In-Line Packages (PDIP), all available in environmentally friendly versions.

| Safety | 2-wire Bus | 3-wire Bus | SPI Bus |
|---|---|---|---|
| Airbags | | AT93C46DN-SP25-T<br>AT93C46-10TQ-2.7<br>AT93C56B-SSPD-T<br>AT93C56B-XPD-T<br>AT93C66B-SSPD-T<br>AT93C66B-XPD-T<br>AT93C86A-10SQ-2.7<br>AT93C86A-10TQ-2.7 | AT25020B-SSPD-T<br>AT25020B-XPD-T<br>AT25040B-SSPD-T<br>AT25040B-XPD-T<br>AT25080B-SSPD-T<br>AT25080B-XPD-T<br>AT25160B-SSPD-T<br>AT25160B-XPD-T<br>AT25320B-SSPD-T<br>AT25320B-XPD-T<br>AT25640B-SSPD-T<br>AT25640B-XPD-T<br>AT25128B-SSPD-T<br>AT25128B-XPD-T<br>AT25256B-SSPD-T<br>AT25256B-XPD-T |
| Anti-lock Brake Systems | AT24C02C-SSPD-T<br>AT24C02C-XPD-T<br>AT24C04C-SSPD-T<br>AT24C04C-XPD-T | AT93C46DN-SP25-T<br>AT93C46-10TQ-2.7<br>AT93C56B-SSPD-T<br>AT93C56B-XPD-T<br>AT93C66B-SSPD-T<br>AT93C66B-XPD-T<br>AT93C86A-10SQ-2.7<br>AT93C86A-10TQ-2.7 | AT25040B-SSPD-T<br>AT25040B-XPD-T<br>AT25080B-SSPD-T<br>AT25080B-XPD-T<br>AT25160B-SSPD-T<br>AT25160B-XPD-T<br>AT25320B-SSPD-T<br>AT25320B-XPD-T<br>AT25640B-SSPD-T<br>AT25640B-XPD-T<br>AT25128B-SSPD-T<br>AT25128B-XPD-T<br>AT25256B-SSPD-T<br>AT25256B-XPD-T |
| Engine Control | | AT93C56B-SSPD-T<br>AT93C56B-XPD-T<br>AT93C66B-SSPD-T<br>AT93C66B-XPD-T<br>AT93C86A-10SQ-2.7<br>AT93C86A-10TQ-2.7 | AT25040B-SSPD-T<br>AT25040B-XPD-T<br>AT25080B-SSPD-T<br>AT25080B-XPD-T<br>AT25160B-SSPD-T<br>AT25160B-XPD-T<br>AT25128B-SSPD-T<br>AT25128B-XPD-T<br>AT25256B-SSPD-T<br>AT25256B-XPD-T |

# Serial EEPROMs (Continued)

| Safety | 2-wire Bus | 3-wire Bus | SPI Bus |
|---|---|---|---|
| TPMS System | AT24C01C-SSPD-T<br>AT24C01C-XPD-T<br>AT24C02C-SSPD-T<br>AT24C02C-XPD-T<br>AT24C04C-SSPD-T<br>AT24C04C-XPD-T<br>AT24C08C-SSPD-T<br>AT24C08C-XPD-T<br>AT24C16C-SSPD-T<br>AT24C16C-XPD-T | AT93C46DN-SP25-T<br>AT93C46-10TQ-2.7<br>AT93C56B-SSPD-T<br>AT93C56B-XPD-T<br>AT93C66B-SSPD-T<br>AT93C66B-XPD-T<br>AT93C86A-10SQ-2.7<br>AT93C86A-10TQ-2.7 | AT25010B-SSPD-T<br>AT25010B-XPD-T<br>AT25020B-SSPD-T<br>AT25020B-XPD-T<br>AT25040B-SSPD-T<br>AT25040B-XPD-T |

| Accessories | 2-wire Bus | 3-wire Bus | SPI Bus |
|---|---|---|---|
| Audio | AT24C08C-SSPD-T<br>AT24C08C-XPD-T<br>AT24C16C-SSPD-T<br>AT24C16C-XPD-T<br>AT24C32D-SSPD-T<br>AT24C32D-XPD-T<br>AT24C64D-SSPD-T<br>AT24C64D-XPD-T | AT93C46DN-SP25-T<br>AT93C46-10TQ-2.7<br>AT93C56B-SSPD-T<br>AT93C56B-XPD-T<br>AT93C66B-SSPD-T<br>AT93C66B-XPD-T<br>AT93C86A-10SQ-2.7<br>AT93C86A-10TQ-2.7 | |
| Dashboard | AT24C01C-SSPD-T<br>AT24C01C-XPD-T<br>AT24C02C-SSPD-T<br>AT24C02C-XPD-T<br>AT24C04C-SSPD-T<br>AT24C04C-XPD-T<br>AT24C08C-SSPD-T<br>AT24C08C-XPD-T<br>AT24C16C-SSPD-T<br>AT24C16C-XPD-T | AT93C46DN-SP25-T<br>AT93C46-10TQ-2.7<br>AT93C56B-SSPD-T<br>AT93C56B-XPD-T<br>AT93C66B-SSPD-T<br>AT93C66B-XPD-T<br>AT93C86A-10SQ-2.7<br>AT93C86A-10TQ-2.7 | AT25020B-SSPD-T<br>AT25020B-XPD-T<br>AT25040B-SSPD-T<br>AT25040B-XPD-T<br>AT25080B-SSPD-T<br>AT25080B-XPD-T<br>AT25128B-SSPD-T<br>AT25128B-XPD-T<br>AT25160B-SSPD-T<br>AT25160B-XPD-T |
| Driver Information and Assistance | AT24C01C-SSPD-T<br>AT24C01C-XPD-T<br>AT24C02C-SSPD-T<br>AT24C02C-XPD-T<br>AT24C04C-SSPD-T<br>AT24C04C-XPD-T<br>AT24C08C-SSPD-T<br>AT24C08C-XPD-T<br>AT24C16C-SSPD-T<br>AT24C16C-XPD-T | AT93C46DN-SP25-T<br>AT93C46-10TQ-2.7<br>AT93C56B-SSPD-T<br>AT93C56B-XPD-T<br>AT93C66B-SSPD-T<br>AT93C66B-XPD-T<br>AT93C86A-10SQ-2.7<br>AT93C86A-10TQ-2.7 | AT25010B-SSPD-T<br>AT25010B-XPD-T<br>AT25020B-SSPD-T<br>AT25020B-XPD-T<br>AT25040B-SSPD-T<br>AT25040B-XPD-T<br>AT25080B-SSPD-T<br>AT25080B-XPD-T<br>AT25160B-SSPD-T<br>AT25160B-XPD-T |
| TPMS System | AT24C08C-SSPD-T<br>AT24C08C-XPD-T<br>AT24C16C-SSPD-T<br>AT24C16C-XPD-T<br>AT24C32D-SSPD-T<br>AT24C32D-XPD-T<br>AT24C64D-SSPD-T<br>AT24C64D-XPD-T<br>AT24C128C-SSPD-T<br>AT24C128C-XPD-T<br>AT24C256C-SSPD-T<br>AT24C256C-XPD-T | AT93C46DN-SP25-T<br>AT93C46-10TQ-2.7<br>AT93C56B-SSPD-T<br>AT93C56B-XPD-T<br>AT93C66B-SSPD-T<br>AT93C66B-XPD-T<br>AT93C86A-10SQ-2.7<br>AT93C86A-10TQ-2.7 | AT25080B-SSPD-T<br>AT25080B-XPD-T<br>AT25160B-SSPD-T<br>AT25160B-XPD-T<br>AT25320B-SSPD-T<br>AT25320B-XPD-T<br>AT25640B-SSPD-T<br>AT25640B-XPD-T<br>AT25128B-SSPD-T<br>AT25128B-XPD-T<br>AT25256B-SSPD-T<br>AT25256B-XPD-T |

# Atmel Car Radio Solutions

Atmel has over 30 years experience in designing broadcast radio solutions. The company's in-depth know-how and high quality standards (ISO9001 and ISO16949) make it possible to achieve the stringent quality and performance requirements of the car radio market.

Today, Atmel is recognized for offering IC solutions with maximum performance, flexibility and integration levels required for the rapidly expanding AM/FM active antenna market. Atmel antenna devices can be used in any antenna regardless of design type—pole, shark fin, short pole or glass/window antenna.

## Active Antenna ICs

| Part No. | Description | Package |
|----------|-------------|---------|
| ATR4251C | Low-noise AM/FM Antenna Amplifier with AGC Function at AM and FM, and Large AM Frequency Range | SSO20 QFN24 |
| ATR4252C | All-in-one IC Solution for Active Antennas | QFN28 |
| ATR4253C | Integrated Circuit Solution for Active Antennas (FM, DAB, DVB-T, ISDB-T) | QFN16 |

Atmel | Enabling Unlimited Possibilities®